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Lifestyle behaviour and risk factor control in coronary patients: Belgian results from the cross-sectional EUROASPIRE surveys

Delphine De Smedt[a], Johan De Sutter[b,c], Michel De Pauw[c,d], Hans Vandekerckhove[e], Jan Trouerbach[f], Guy De Backer[a], Anne-Marie Willems[b], Sofie Pardaens[a], Pieter Vervaet[d], Nancy Deweerdt[e] and Dirk De Bacquer[a]

[a]Department of Public Health, Ghent University, Gent, Belgium; [b]Department of Cardiology, AZ Maria Middelares Gent, Gent, Belgium; [c]Department of Internal Medicine, Ghent University, Gent, Belgium; [d]Department of Cardiology, Ghent University Hospital, Gent, Belgium; [e]Department of Cardiology, AZ Sint Lucas Gent, Gent, Belgium; [f]Department of Cardiology, AZ Jan Palfijn Gent, Gent, Belgium

ABSTRACT

Objective: The aim of this study was to assess lifestyle behaviour as well as risk factor management across Belgian coronary patients who participated in the cross-sectional European Action on Secondary Prevention through Intervention to Reduce Events (EUROASPIRE) surveys.

Methods: Analyses are based on a series of coronary patients by combining data from the Belgian participants in the EUROASPIRE III (328 patients; in 2006–2007) and EUROASPIRE IV (343 patients; in 2012–2013) surveys. Four hospitals located in the Ghent area participated in the surveys. Patients included in the analyses were ≥18 years old and had been hospitalised for a coronary event. Information on cardiovascular risk factors, lifestyle behaviour and medical treatment were obtained.

Results: Overall, the proportion of smokers was 11% with 40% persistent smokers. Adequate physical activity levels were reported by 17%, 28% of patients were obese, 47% was central obese and known diabetes was prevalent in 21% of patients. Hypertension was observed in 46% of patients and 20% had a total cholesterol ≥5 mmol/L. About 80% had participated in a cardiac rehabilitation programme and the majority of patients were treated with blood pressure (92%) or lipid-lowering drugs (92%). Anxiety and depressive symptoms were reported by 30% and 24%, respectively. Differences between EUROASPIRE III and IV were limited.

Conclusions: Compared to the overall EUROASPIRE results in Europe, Belgian CHD patients seem to do slightly better. However, tackling obesity, physical inactivity, hypertension and psychosocial distress remains an important challenge in the management of coronary patients.

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Introduction

Life expectancy has increased in most western countries over the last decades. However, cardiovascular disease (CVD) remains the leading cause of death across Europe [1]. In Belgium, CVD accounts for 28.8% of the total mortality. About 29.5% of all CVD deaths are due to ischaemic heart disease [2]. In addition to the mortality burden, CVD is also associated with a substantial morbidity burden. CVD is the second most important cause of disability-adjusted life years (DALYs) in Belgium, with ischaemic heart disease responsible for 7.1% of DALYs [3].

Several guidelines have been developed over the last decades, in order to reduce the cardiovascular burden. The European Society of Cardiology (ESC) published his first joint guidelines on cardiovascular prevention in 1994 with regular updates since [4–9]. In order to assess whether these guidelines are followed in clinical practice, the EUROASPIRE (European Action on Secondary Prevention through Intervention to Reduce Events) surveys were initiated. A first survey was performed across 9 European countries in 1995–1996 [10]. Since then, three additional EUROASPIRE surveys took place (EUROASPIRE II in 1999–2000; EUROASPIRE III in 2006–2007; EUROASPIRE IV in 2012–2013) the latest one included 24 European countries [11–13]. Overall, the EUROASPIRE surveys show a suboptimal adherence to lifestyles and an insufficient risk factor control in coronary patients [14].

In the 3rd and 4th wave of the survey, the interview and physical measurements were organised in a strictly comparable way. Several hospitals located in

CONTACT Delphine De Smedt delphine.desmedt@ugent.be Department of Public Health, Ghent University, De Pintelaan 185, 9000 Ghent, Belgium

the city of Ghent, Belgium, took part in the latest two surveys. The aim of this study was to analyse the prevalence of risk factors across these coronary patients and to assess how the prevention guidelines have been implemented in clinical practice over the latest decade.

Methods

Analyses are based on data from the repeated cross-sectional EUROASPIRE surveys performed in selected geographical areas [12–13]. All hospitals from the city of Ghent with cardiology facilities (Ghent University Hospital, AZ Maria Middelares, AZ Sint-Lucas, AZ Jan Palfijn), took part in EUROASPIRE III (328 patients; in 2006–2007) and three of them (Ghent University Hospital, AZ Maria Middelares, AZ Sint-Lucas) in EUROASPIRE IV (343 patients; in 2012–2013). The Ghent district has over half a million inhabitants [15]. For each survey, a new sample of coronary patients was recruited. Patients could only be included once. Consecutive patients, men and women (between 18 and 80 years at the time of their index event), hospitalised for a first or recurrent myocardial infarction, coronary artery bypass graft surgery, elective or emergency percutaneous coronary intervention or acute myocardial ischaemia (referred to as index event) were identified and invited to participate. Patients were interviewed and examined at least 6 months but no more than 3 years following the index event, by trained research staff. Information on personal and demographic factors, medical and cardiovascular history, reported lifestyle and risk factor management was collected.

At the time of the interview, a physical examination was performed, assessing height and weight (in light indoor clothes without shoes using a SECA 701/220 [SECA, Hamburg, Germany]), waist circumference, blood pressure (measured at least twice in sitting position with an automatic digital sphygmomanometer, Omron M5-1 in EUROASPIRE III and Omron M6 in EUROASPIRE IV [Omron Healthcare, Kyoto, Japan]), breath carbon monoxide (using a smokerlyzer Bedfont Scientific Micro 4 in EUROASPIRE III and Bedfont Scientific Micro + in EUROASPIRE IV [Bedfont Scientific, Kent, UK]), serum total cholesterol, HDL-cholesterol and HbA1c in patients with diabetes. Blood analyses were performed in one central laboratory (National Institute for Health and Welfare, Helsinki, Finland). Furthermore, during the interview patients were asked about their current risk factors including medical management, diabetes, and smoking. Physical activity levels were assessed by asking patients to describe their level of activity outside of work using a Likert scale including the following answer categories: no physical activity weekly; only light physical activity in most weeks; vigorous physical activity at least 20 min once or twice a week; vigorous physical activity for at least 20 min three or more times a week. In addition, patients were asked to indicate whether they were regularly active (e.g. brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) in order to increase their physical fitness. Furthermore, information on their medical treatment and attendance to cardiac rehabilitation was collected. Psychological distress and self-perceived health status were measured in using the hospital anxiety and depressions scale (HADS) [16] – including seven items on depressive symptoms and seven items on anxiety symptoms- and the EQ-5D instrument [17] – consisting of a five-item questionnaire (EQ-5D-3L in EUROASPIRE III and EQ-5D-5L in EUROASPIRE IV) and a visual analogue scale. The HADS questionnaire allows to calculate an anxiety (HADS-A) and depression (HADS-D) score on a scale from 0 to 21. The EQ-5D items result in an index score from 0 (worst health state) to 1 (perfect health), whereas the VAS ranges from 0 (worst imaginable health state) to 100 (best imaginable health state).

For analytical purposes, risk factor targets were defined (see Table 1).

Statistical analyses

Descriptive analyses were used to gain knowledge on the prevalence of risk factors and risk factor management. Differences in risk factor prevalence and risk factor management between EUROASPIRE III and IV were assessed with binary logistic regression or linear regression, adjusted for a predefined set of basic patient characteristics (gender, age and educational level at index event). All appropriate model assumptions were fulfilled, with the exception of the continuous EQ-5D scale because of its ceiling effect. Non-parametric testing for this variable resulted in similar outcomes. Type I error due to multiple testing was accounted for with the Benjamini–Hochberg procedure by including all variables at once.

Low education was defined as ‘Less than primary school’ or ‘Primary school completed’; secondary education was defined as ‘Secondary school completed’ or ‘High school completed’ or ‘Intermediate between secondary level (e.g. technical training)’; high education was defined as ‘College/University completed’ or ‘having obtained a Postgraduate degree’. Significance levels were set at $p < .05$ (two-sided). Analyses were

performed using IBM SPSS version 21 (IBM SPSS Statistics, Armonk, NY).

Results

In total, information on 671 CHD patients was available (328 patients took part in EUROASPIRE III and 343 patients in EUROASPIRE IV). Patient characteristics were comparable across surveys. The mean age was 64.2 (9.5) years and the majority of participants (85.7%) were males. Revascularisation procedures as recruiting diagnosis were seen in 87.6% of patients. Furthermore, 22.3% of patients were low educated and 23.8% had completed high education.

Physical measurements

Patients had a mean BMI of 28.4 (4.4) kg/m^2. The average waist was 100.2 (12.9) cm in men and 93.6 (15.1) cm for women. The average blood pressure both systolic as well as diastolic was significantly lower in EA IV compared to EA III (138.7 (21.7) and 81.2 (12.2) mmHg and 132.9 (18.3) and 78.0 (10.7) mmHg, respectively). Likewise, total cholesterol (from 4.5 to 4.3 mmol/L) as well as LDL-cholesterol (from 2.5 to 2.4 mmol/L) improved significantly from EAIII to EAIV. Finally, the average HbA1c among patients with diabetes was 6.8% in EA IV compared with 7.4% in EA III (see Table 2).

Risk factors on target

About 11% of patients are smokers (see Table 3). Of those patients who were smoking during the month prior to the index event, 40% is still smoking at the time of the interview. Also, 28% of patients is obese and 47% of patients is central obese. Adequate physical activity levels, performing vigorous physical activity levels for at least 20 min three or more times a week is seen in 17% of patients. Over the latest two surveys a significant drop in adequate physical activity was seen (23% in EAIII and 12% in EAIV). In contrast, on average 50% of patients indicated to have been physically active in order to increase their physical fitness (e.g. brisk walking, aerobics, jogging, bicycling,

Table 1. Risk factor targets.

Elevated blood pressure	Systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg (≥80 mmHg in patients with diabetes) (average of two readings in standard conditions)
Elevated low density lipoprotein cholesterol (LDL-cholesterol)	LDL-cholesterol ≥2.5 mmol/L (100 mg/dL)
Elevated total cholesterol (TC)	TC-cholesterol ≥5 mmol/L (190 mg/dL)
Elevated HbA1c (in patients with diabetes)	HbA1c ≥7.0%
Central obesity	Waist circumference ≥88 cm in women and ≥102 cm in men
Overweight	Body mass index (BMI) ≥ 25 kg/m^2
Obesity	BMI ≥30 kg/m^2
Current smokers	Self-reported smoker or CO in breath >10 ppm
Persistent smoking	Current smokers who were smoking in the month prior to the index event
Adequate physical activity level	Vigorous physical activity outside work for at least 20 min three or more times a week
Regular exercise	Regular physical exercise to increase physical fitness, causing an increase in breathing rate and causing sweating
Diabetes	Self-reported diabetes
Cardiac rehabilitation attended	Attending at least half of the advised rehabilitation sessions
Possible anxiety	HADS-A ≥8
Possible depression	HADS-D ≥8
Probable anxiety	HADS-A ≥11
Probable depression	HADS-D ≥11

Table 2. Patient characteristics.

	EUROASPIRE	EUROASPIRE III	EUROASPIRE IV	*p* Value
Age	64.2 (9.5)	62.2 (9.0)	66.1 (9.5)	<.001
Males (%)	84% (564/671)	86% (281/328)	83% (283/343)	.263
Revascularisation as IE (%)	88% (588/671)	90% (294/328)	86% (294/343)	<.001
High education	24% (158/664)	24% (78/323)	23% (80/341)	<.001
BMI	28.4 (4.4)	28.2 (4.2)	28.6 (4.6)	.246
Waist (men)	100.2 (12.9)	99.7 (11.9)	100.8 (13.8)	.300
Waist (women)	93.6 (15.1)	95.2 (12.7)	92.4 (16.8)	.363
Systolic blood pressure	135.7 (20.2)	138.7 (21.7)	132.9 (18.3)	.001
Diastolic blood pressure	79.5 (11.6)	81.2 (12.2)	77.9 (10.7)	<.001
Total cholesterol	4.3 (0.9)	4.5 (0.9)	4.3 (0.9)	.008
LDL-cholesterol	2.4 (0.7)	2.5 (0.7)	2.4 (0.7)	.011
HbA1c (in diabetes patients)	7.0 (1.4)	7.4 (2.0)	6.8 (1.0)	.048

Mean (SD) or %; Unadjusted *p*-values.

swimming, rowing, etc., 3–5 times per week for 20–60 min per session) with a small, but significant increase from 47 to 53% between both surveys. Furthermore, 21% of patients had diabetes. Overall, an elevated blood pressure was seen in 46% of patient, with a significant decrease from 50 to 43% between the IIIrd and IVth survey. A total cholesterol ≥5 mmol/L was seen in 20% of patients, and 40% of patients had an LDL-cholesterol ≥2.5 mmol/L. The proportion of patients with an elevated LDL-cholesterol decreased significantly from 50 to 33%. Finally, 38% of patients with diabetes had an HbA1c ≥7% (44% in EA III and 35% in EA IV).

Medical treatment and rehabilitation

About 92% of patients was on blood pressure lowering medication (see Table 4), very similar in both surveys. About 95% of patients were on aspirin or antiplatelet medication, 80% was on beta blockers and 39% on ACE inhibitors. Likewise, 92% of patients was on lipid-lowering medication, with 91% of patients taking statins. A significant increase in statin intake was observed between surveys (88–94%). Cardiac rehabilitation (attending more than half of the sessions) was followed by 80% of patients. A significant increase was seen between surveys (77–83%).

Psychological distress and self-perceived health status

Anxiety symptoms were reported by 30% of the patients and 24% of the patients reported depressive symptoms (see Table 5). A probable anxiety disorder (HADS-A ≥11) was seen in 12% of patients and 8.2% of patients suffered from a probable depression disorder (HADS-D ≥11). The mean HADS-A and HADS-D were 5.7 (3.9) and 4.9 (3.7), respectively. An average EQ-5D index of 0.80 (0.22) was observed, with a significant decrease over time (0.83 (0.22) versus 0.78 (0.21)). Patients rated their health status on a VAS scale as 73 (15.8) on average.

Significant differences between EUROASPIRE III and IV remained significant after the Benjamini–Hochberg Procedure for multiple testing.

Discussion

This manuscript provides an overview of how guidelines on secondary prevention are implemented in

Table 3. Prevalence of risk factor on target.

	EUROASPIRE	EUROASPIRE III	EUROASPIRE IV	*p* Value
Risk factor at interview				
Smoking	11% (72/669)	13% (44/326)	8% (28/343)	.209
Persistent smokers[a]	40% (65/161)	41% (39/94)	39% (26/67)	.540
Obese	28% (187/668)	26% (83/325)	30% (104/343)	.260
Central obese	47% (310/663)	46% (147/323)	48% (163/340)	.980
Adequate physical activity	17% (112/647)	23% (72/318)	12% (40/329)	.018*
Regular physical activity	50% (330/659)	47% (149/318)	53% (181/341)	.018*
Diabetes	21% (137/657)	19% (60/322)	23% (77/335)	.576
Elevated blood pressure[b]	46% (307/661)	50% (162/328)	43% (145/335)	.005*
Elevated total cholesterol[c]	20% (111/554)	25% (55/218)	17% (56/336)	.051
Elevated LDL-cholesterol[d]	40% (216/546)	50% (107/216)	33% (109/330)	.001*
Elevated HbA1c[e]	38% (40/106)	44% (15/34)	35% (25/72)	.288

[a]Smoking in those patients who were smoking one month prior to the index event.
[b]Elevated blood pressure on target: SBP/DBP ≥140/90 mmHg (≥140/80 mmHg in patients with diabetes).
[c]Elevated TC on target: TC ≥5 mmol/L.
[d]Elevated LDL-cholesterol: LDL-cholesterol ≥2.5 mmol/L.
[e]Elevated HbA1c: HbA1c ≥7% in patients with diabetes.
p Values from logistic regression adjusted for age, gender and education.
**p* Value remains significant after Benjamini–Hochberg procedure.

Table 4. Medication and rehabilitation.

	EUROASPIRE	EUROASPIRE III	EUROASPIRE IV	*p* Value
Aspirin or other antiplatelet	95% (632/668)	94% (304/325)	96% (328/343)	.108
Beta-blocker	80% (534/668)	80% (260/325)	80% (274/343)	.928
ACE inhibitor	39% (260/668)	39% (128/325)	38% (132/343)	.767
BP lowering	92% (613/668)	92% (298/325)	92% (315/343)	.675
Statin	91% (608/668)	88% (285/325)	94% (323/343)	.009*
Lipid lowering	92% (613/338)	87% (288/325)	95% (325/343)	.012*
Cardiac rehabilitation	80% (416/517)	77% (195/252)	93% (221/265)	.009*

p Values from logistic regression adjusted for age, gender, and education.
**p* Value remains significant after Benjamini–Hochberg procedure.

Belgian patients with CHD. Combining information from EUROASPIRE III and IV provides us with a sample of 671 patients with stable CHD. In this population, one in 10 patients was a smoker, with about three in five prior smokers having made a successful smoking cessation attempt. About 28% of patients are obese and central obesity was seen in almost half of patients. Although one in two patients performs regular exercise causing an increase in breathing rate or sweating, only 17% is adequate physically active according to the guidelines. Diabetes is reported by 21% of patients. Slightly more than half of patients have a BP on target and three in five patients have their LDL-cholesterol on target. With regard to medication use, a large majority of patients was on blood pressure lowering drugs and on lipid-lowering drugs.

Comparing the Belgian series of CHD patients form EUROASPIRE III with EUROASPIRE IV revealed by and large the same results with some exceptions. A significant decrease in patients with elevated blood pressure levels and elevated LDL-cholesterol levels was seen as well as a significant increase in statin use and cardiac rehabilitation. These improvements are probably a reflection of the changes in clinical management as a response to the updated guidelines with more stringent targets.

The contrasting findings regarding physical activity levels, with a decrease observed inadequate physical activity and an increase seen in regular activity might be caused by the content of the questions included in the questionnaire. Whereas the former asks about vigorous physical activity outside work with four answer possibilities ranging from no physical activity to vigorous physical activity for at least 20 min three or more times a week, the latter question only provides a yes/no answer with no further details on the level of physical activity. Indeed, a closer look at the different answer possibilities regarding adequate physical activity revealed a shift from vigorous physical activity in EAIII to light physical activity in EAIV, which could mean that more patients are physically active, but most of them perform only light physical activity.

Compared with the overall results of the latest EUROASPIRE IV survey including 24 countries (Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Finland, France, Germany, Greece, Ireland, Latvia, Lithuania, the Netherlands, Poland, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Turkey, Ukraine and the UK) [13], the risk factor management of Belgian patients corresponds with the average result. No substantial differences were seen in the prevalence of risk factors, with the exception of smoking (EUROASPIRE IV average 16%), obesity (EUROASPIRE IV average 38%) and central obesity (EUROASPIRE IV average 58%). Lipid-lowering medication intake was higher compared to the overall EUROASPIRE IV result (87% on lipid-lowering medication).

A comparison with the Belgian results of the earlier EUROASPIRE II survey (1999–2000) -considering patients until 71 years old, since that was the upper age limitation in EUROASPIRE II – revealed a substantial improvement in risk factor prevalence as well as risk factor management. The prevalence of obesity and central obesity remained more or less the same as well as the mean BP values, whereas the proportion of smokers and patients with elevated LDL cholesterol more than halved. Medication use increased substantially since 2000, in particular the use of lipid-lowering medication, mainly the use of statins with only 43% of patients taking statins in EUROASPIRE II [11]. Notable, an improvement was seen in the proportion of patients having an accumulation of risk factors, which could potentially lead to better long-term outcomes.

In our Belgian sample, possible or probable anxiety disorders were seen in 30.2%, whereas 25.7% of patients suffered from a possible or probable depressive disorder. On European level, 26% of patients had a HADS-A $\geq$8 and 22% of patients had a HADS-D $\geq$8. Problems with anxiety and depression are very common in coronary patients. Celano et al. found a prevalence of depressive feelings ranging between 31 and 45% [18]. Likewise, anxiety symptoms are prevalent in 24–36% of CHD patients [19,20]. The prevalence of psychological distress is known to be a predictor of

Table 5. Psychological distress and health status.

	EUROASPIRE	EUROASPIRE III	EUROASPIRE IV	*p* Value
HADS-A $\geq$8	30% (186/615)	33% (91/273)	28% (95/342)	.236
HADS-D $\geq$8	24% (146/615)	26% (70/273)	22% (76/342)	.191
HADS-A	5.7 (3.91)	5.9 (3.71)	5.5 (4.05)	.401
HADS-D	4.9 (3.65)	5.0 (3.86)	4.7 (3.48)	.099
EQ-5D[a]	0.80 (0.22)	0.83 (0.22)	0.78 (0.22)	.016*
EQ-VAS	73 (15.77)	72 (16.27)	74 (15.36)	.214

[a]EQ-5D-3L was used in EUROASPIRE III and EQ-5D-5L was used in EUROASPIRE IV.
% or mean (SD); *p* values from regression analyses adjusted for age, gender, and education.
**p* Value remains significant after Benjamini–Hochberg procedure.

worse coronary outcomes [21]. Doyle et al. have shown that psychological distress also results in lower smoking cessation rates in coronary patients, which support the fact that behavioural changes are more likely to occur in non-depressed and non-anxious patients [22]. Regarding the drop in EQ-5D index score between the latest two surveys, it is important to notice that in EUROASPIRE III the EQ-5D-3L was used whereas in EUROASPIRE IV the more sensitive EQ-5D-5L was included, which could explain the significant difference between surveys.

The EUROASPIRE surveys make use of standardised interview and examination procedures performed by trained personnel. However, there are some limitations to the study. In the context of these analyses, especially the external validity of results poses a restriction on the generalisability of the findings. Since the Belgian data are drawn from coronary patients in hospitals located in the Ghent area, the results might not be representative for the entire country. Furthermore, although statistical adjustment for patient characteristics was performed, patients across surveys might differ on several other unknown variables which can have an influence on their risk factor profile. Finally, much of the information gathered is based on self-reported data, making the results subject to possible recall bias and social desirability bias. Also due to selection bias, it might be that those patients willing to participate are doing better or behave more exemplary with better compliance rates.

In conclusion, compared to the other countries included in the EUROASPIRE survey, Belgian CHD patients perform slightly better on several risk factors, with the exception of anxiety and depression feelings. However, even considering the more conservative risk factors, there remains a considerable room for improvement, in particular with regard to obesity and central obesity prevalence, hypertension and physical activity. Clinical treatment of CHD patients should further focus on the prevalence of these risk factors.

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ORCID

Johan De Sutter http://orcid.org/0000-0003-1433-8152

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